

**INTEGRATED MULTI-DISCIPLINARY OPTIMIZATION PROCESS FOR  
THERMAL PROTECTION SYSTEM DESIGN**

ABSTRACT OF THE DISCLOSURE

5

[0043] A multi-disciplinary method for design optimization includes developing a number of single-disciplinary modules, which are integrated into a multi-disciplinary module, and performing system level optimization and sensitivity analyses using the multi-disciplinary module. Each single-disciplinary module includes simulation code which can be run on a computer and interfaced with at least one input file and one output file. Developing single-disciplinary modules includes constructing a reusable component for each single-disciplinary module. The reusable component wraps the simulation code by file parsing the simulation code input and output files. By wrapping the simulation codes, the single-disciplinary modules can be interfaced by placing the reusable components for each single-disciplinary module in communication with each other. The reusable component also formulates a problem by defining objectives, constraints and knowledge rules, as well as selects one or more optimization algorithms. System level optimization can be performed by concurrently performing single-discipline analyses using the communicating single-disciplinary modules.